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Workshop Places at Chessy (Seine-et-Marne Dpt., France): Contextual and Technological Aspects

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Recent excavations at Chessy (Seine-et-Marne department, France) have revealed knapping areas for axe head production in Bartonian (Eocene) silicite close to the mining complex of Jablines. They are attributed by the associated set of tools and the archaeological background to the later part of the Paris Basin Middle Neolithic (*c.* 4300–3700 BCE).

The main characteristics of the knapping places are bifacial shaping to produce axe head preforms. Petrographical analyses show at first examination a close relation to the same silicite beds as those exploited at Jablines. Beside this, some of the artefacts indicate another way of raw material gathering which could match with the Bartonian silicite procurement on a larger scale.

The workshop places may be distinguished as places of different function, mostly devoted to the first steps of preparation (roughing and shaping processes), but another to shaping stages, and a last one essentially concerned with the finishing of manufacturing rough-outs. Considering the very rare fragments of preforms collected on the site and the high quality of the rejected waste products, the skill level was high. From the first flaking of the block, contrary to what is usually inferred, indirect percussion was used since the first flaking of the block.

These workshops add to the information from the other known similar places in this region of the Marne area, including the mining complex of Jablines itself. There were no settlements next to the mines, but in the surrounding areas, and the related distance remains to be explained.

KEY-WORDS: Île-de-France, Middle Neolithic II, silicite workshops, indirect percussion, territory

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INTRODUCTION

In May to July 2016, a development-led excavation operated by SARL Paléotime took place at Chessy –"ZAC des Studios et Congrès" (Seine-et-Marne departement) prior to an extension of the EuroDisney Park (Hauzeur 2018). The investigation covered an area of 20,230 m² and revealed – amongst other features – the presence of chipping areas devoted to the production of axe heads from Eocene (Bartonian) silicites.

The knapping places are located/set up on the plateau overlooking the meanders of the river Marne to the south, in a rich archaeological context of other workshops, settlements, enclosures, and graves dated from the Early to the Final Neolithic (*c*. 5000–2500 BCE; Fig. 1). This part of the Marne valley is well known because of the presence of one mining site at Jablines –"le Haut Château" (Seine-et-Marne department) excavated in 1989–1990 prior to the construction of the TGV North line (Bostyn and Lanchon 1992) and also excavations on several workshops in the area (unpublished).

The sedimentary context of the excavation is that of the upland silts or silts of the plateaus (*Limon des plateaux*) characterised here by a important hydromorphy and a high clay content (up to 26%). A second unit above is a succession of brownish pedogenic layers (B horizon) the top of which contains the artefacts. This level is not influenced by the ongoing pedogenic processes suggesting the existence of an erosion phase in between, confirmed by a consequent lack of artefacts in the workshops as shown by the refitting.

THE WORKSHOP PLACES

The distribution of material found at Chessy is organised in five clusters each representing a place devoted to the shaping of Bartonian silicite axe heads.

The main clusters are located in the northern part of the excavation area. There is one concentration (F13), with smaller "satellite" clusters of material around it, defining a southern sector. Adjacent to it, there are another four, of smaller size ("F17", "H17", "F18" and "F19"), defining a northern sector (Fig. 2 and 3). A total 17,985 objects have been counted, including debris, blocks, flakes and chips to which can be added 55,524 micro-chips and small fragments and debris less than 20 mm coming from the sieving. Part of the latter material (debris) is the consequence of a drainage system set up in the 20th century and crossing the concentration. The results of the granulometric and taphonomic analyses, combined with the vertical projection of the georeferenced

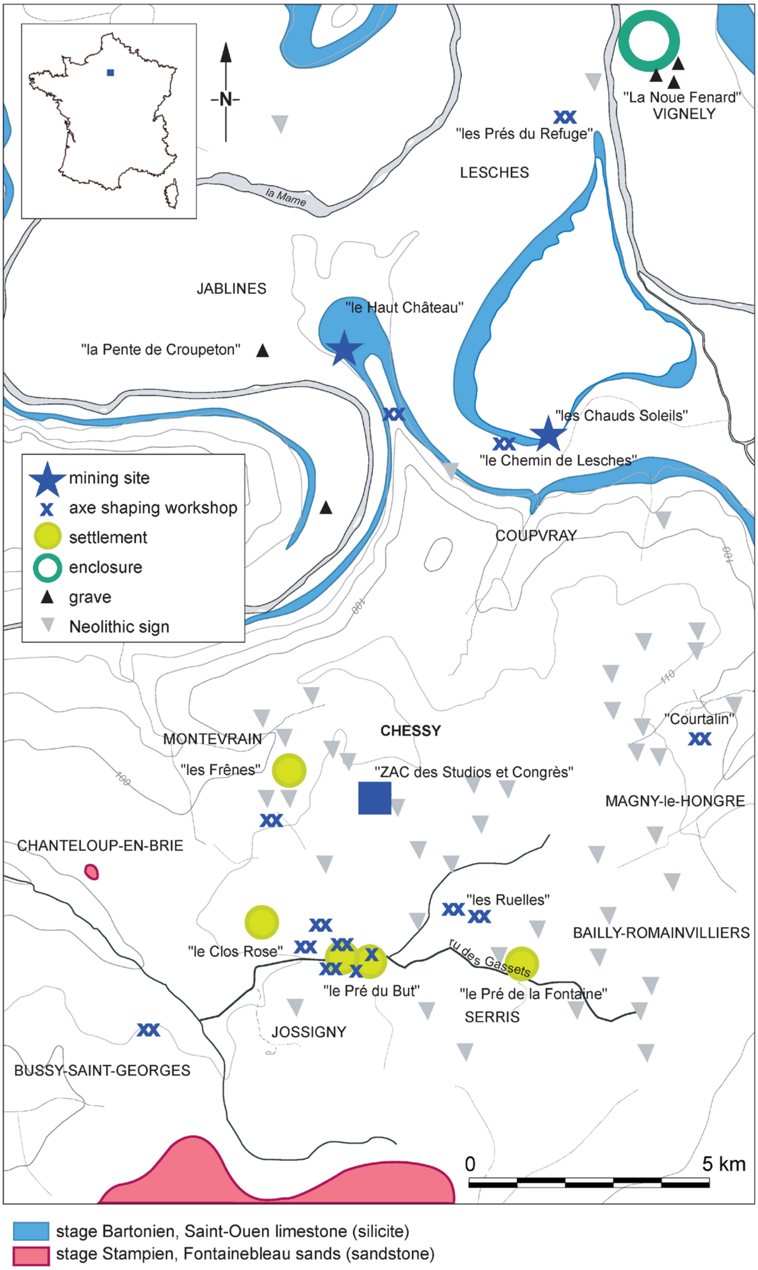


Fig. 1. Geological and archaeological context of the workshops at Chessy – 'ZAC des Studios et Congrès'. Data according to Y. Le Jeune, UMR 8591, V. Brunet, Inrap; modified and completed.

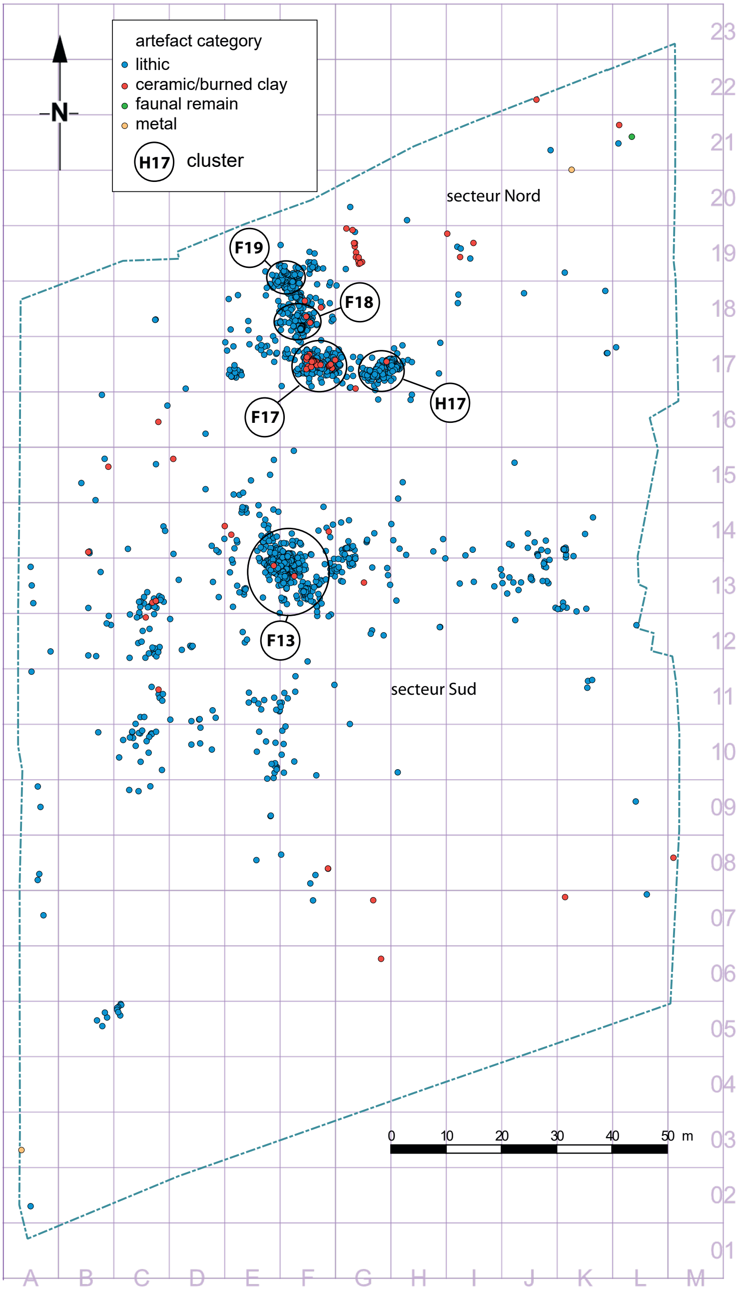


Fig. 2. Spatial distribution of the lithic material with the labeled five clusters in the excavations.

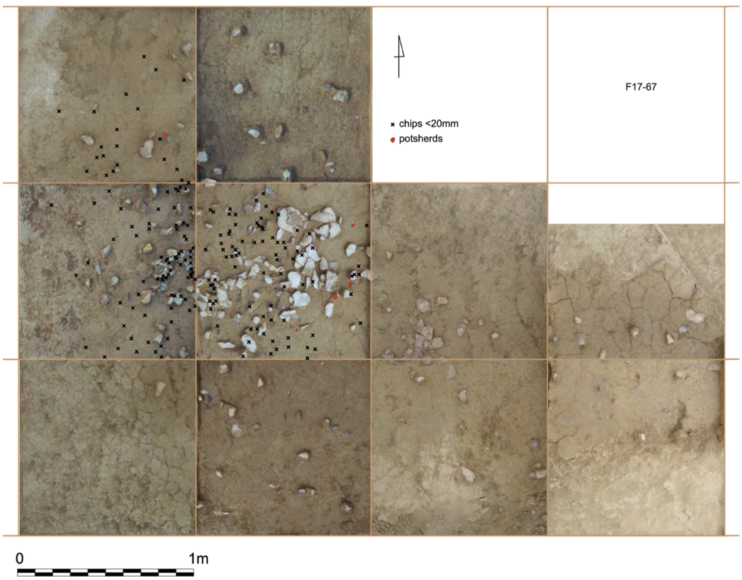
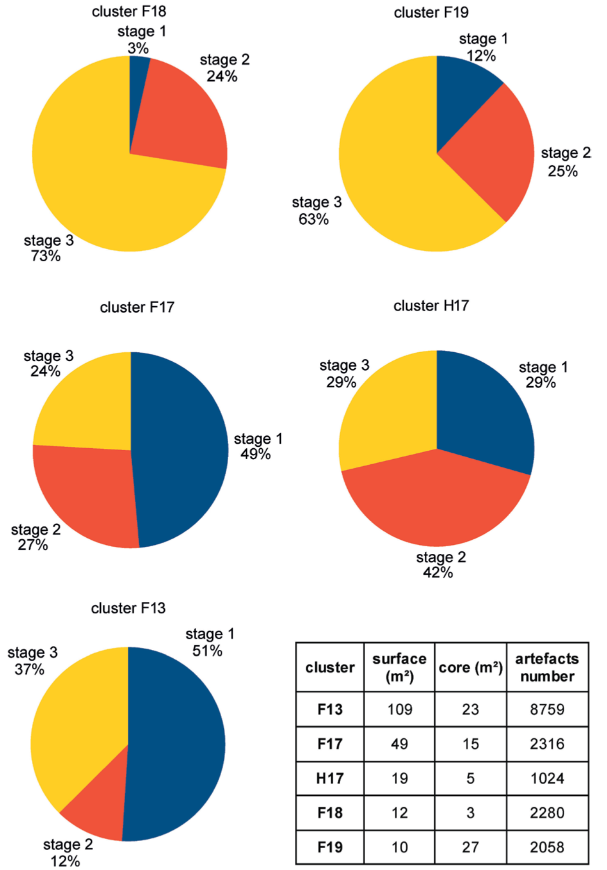


Fig. 3. Zenithal view of excavated square metres from the chipping floor "F17".

finds, show dense concentrations of material constituting the actual core of the clusters and a more diffuse spread of finds spread over several metres. The clusters, or at least what remains of them, show an accumulation of objects of about 10 to 15 cm of thickness. The dilatation is more significant in the most northern clusters, "F18" and "F19", reflecting the effects of post-depositional sedimentary processes operating on the north characterised by a more heterogeneous and more dispersed material.

The study of these different spots shows that all the stages of the *chaîne opératoire* from the first flakes –concerning flat nodules more than the slab-shaped blocks – to the finishing stages (see section 3.2. for definition of the stage) are present everywhere (Fig. 4). But there are relative differences in the waste assemblies that shows that they were produced by one stage rather than another. The clusters "F17" and "F13" differ from the others in the predominance of the first roughing out (stage 1) with very large (cortical) flakes (size over 80 mm). In contrast, "F18" and "F19" are clusters dominated by a majority of thin medium(50–80 mm) to small sized (20–50 mm) flakes coming from the regularization or finishing steps of the preforms (stage 3).

The representativeness of these stages varies from one cluster to another and this raises the question of the significance of these notable differences. Too many elements are missing to enable the complete shaping process to be reconstructed.



cluster	surface (m²)	core (m²)	artefacts number
F13	109	23	8759
F17	49	15	2316
H17	19	5	1024
F18	12	3	2280
F19	10	27	2058

Fig. 4. Relative distribution of the waste flakes according to their stage attribution among the clusters, with the total number of pieces taken into consideration.

In the case of all the clusters, several blocks of raw material were knapped. They can be distinguished on the basis of macroscopic sorting and partial petrographic analysis of the waste flakes. In "F17" for example, estimating the minimal number of shaped blocks at around ten according to the "family" or groups of similar raw material, the number of waste flakes per block is very low (< 135 flakes), in the case of a full *chaîne opératoire* including chips smaller than 20 mm. Experimental series conducted by Jacques Pélegrin on morphologically similar blocks but in Upper Cretaceous flints give between 800 to 1750 g of shaping waste (Augereau 1995: 149–150; only mass is available). Another experiment done in the 1980s with a Grime's Graves nodule gave

242 complete flakes bigger than 20 mm and about 1750 g of waste (Burton 1980: 132). Important gaps in the material, underlined by a low rate of refitting (10% of the artefacts ≥ 50 mm for “F17”), which varies greatly according to the raw material groups and the initial size of the blocks, reflect an important truncation of the series, hindering comparisons with the previous data. Nevertheless, a spatial differentiation of the processing can be suggested according to the spot assemblages. This concerns the roughing phase and mainly the largest blocks. The assumption is that the initial step, designed to lighten the blocks, took place closer to the extraction site. It seems also that the different phases of the *chaîne opératoire* are split between different clusters, between roughing, thinning and shaping on one hand, and regularizing and finishing on the other.

Taken together, the clusters seem to form a coherent whole (working hypothesis), with places more specialised in one or another of the shaping stages. This observation raises the question of the concomitance of the operations on all the blocks represented by these clusters. Were several knappers working in a chain on a set of nodules brought back from the extraction site, or were a few of them making several times and quickly a round trip, knapping in a workshop according to their moods? The only few refittings carried out between “F17” and “H17” at least support the hypothesis of a block moving during its shaping between knappers ... unless it was the knapper moving with their block. Is the production of axe heads the work of one specialised knapper going through the whole process on one block or could it have been the result of two or more workers operating together (Pélegrin 2012: 90)? Given the state of our knowledge on the knapping data (collected material and technical process) at Chessy, these questions are difficult to answer.

Despite such issues, it can be argued with almost certainty that all the clusters located on the site are indeed contemporary (in a cultural group time scale), and that there are not several generations of knappers frequenting this place over decades, although the presence of distinct technical clusters on the excavated site could imply knappers from different communities.

FOCUS ON SOME CHARACTERISTICS

Origin of the raw material

Petrographical analyses conducted on a sample of 108 pieces belonging to the different groups of Bartonian blocks identified macroscopically revealed a gathering of raw material coming from the geological layers (defined as type F717), and a very slight contribution of material gathered on the ground surface near the extraction site (similar petrofabric to F717).

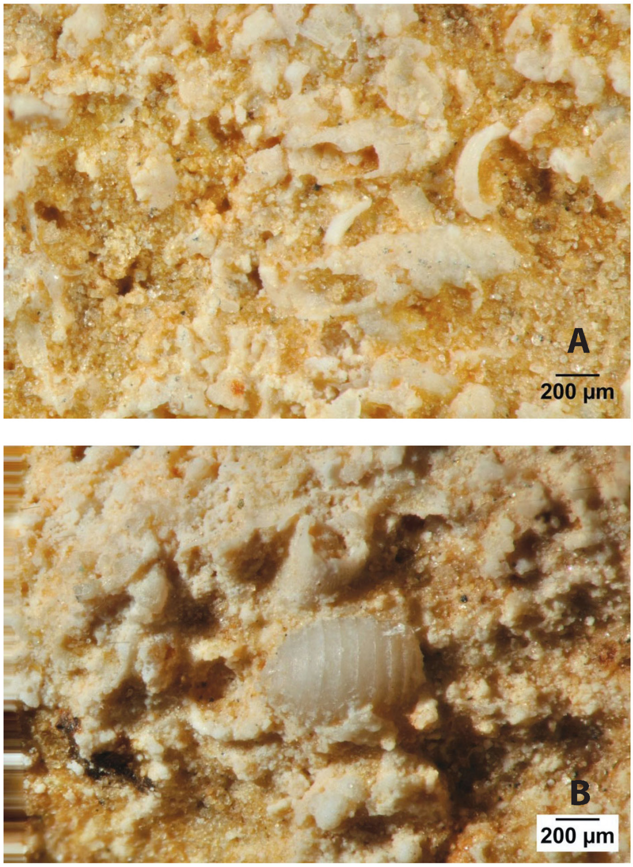


Fig. 5. Well preserved bioclasts at the surface of the cortex of waste flakes.
A. Characeae stems; B. Gyrogonites.

Type F717 has an irregular cortex, sandstone to limestone with alveoli. The lack of cementing and damage as well as numerous fossils in high relief on the surface confirm that the silicite nodules of Chessy had been collected in primary position (Fig. 5). Two microfacies can be distinguished by the dominant frequency of Gyrogonites and Characeae stems on one hand, and the ostracodes on the other.

The raw material procurement compares with that of the mining area of Jablines – "le Haut Chateau" (Bostyn and Lanchon 1992) and probably also Coupvray – "les Chauds Soleils" (Seine-et-Marne department; Arnette 1961: 74–80) located at about 5 km as the crow flies in the Marne valley. This assumption is supported by our field surveys around the two mining sites. Chessy is therefore part of a vast mining area exploiting similar silicite types in a local way.

Indirect percussion evidence and level of know-how

The classical scheme proposed by French researchers for the shaping of axe preforms ready to be polished is divided into three main stages (Bostyn and Lanchon 1992: 170; Augereau 1995; 2004: 79; synthesis in Pélegrin 2012): 1. Roughing a first bifacial shape; 2. Morphological regularization of this shape creating (bi)convex sides and thinning process; 3. Straightening the sides and the cutting edge. For each of them one or several knapping techniques were applied, respectively: 1. Direct percussion and the use of hammerstones; 2. Direct percussion and the use of organic (soft) hammers – indirect percussion has been rarely observed at the end of this stage (Pélegrin 2012); 3. Use of organic percussion, indirect percussion and pressure (Pélegrin 2012).

While trying the refittings on the "F17" and "H17" clusters, we made some original observations on the knapping techniques and the shaping methods. The corpus for the refittings comprised large flakes and flake fragments of 50 mm or over (N = 412 in "F17"; N = 171 in "H17"). This knapping waste was distributed in 7 raw material families for "F17" and 9 for "H17". In these groups of large flakes, virtually all the material represents the first and second shaping stages. We could perform a knapping technique diagnosis of over 217 flakes from "F17" and 61 from "H17" (meaning a butt was present on practically all these flakes, although we could not perform an appropriate diagnosis on every flake with a butt). Besides the stone hammer percussion (hard hammer or soft stone) associated with the first stage, we identified organic percussion mostly associated with stage 2, and surprisingly, indirect percussion associated with stages 1 and 2 (Fig. 6). In "F17" and "H17", 10% of the large flakes collection have been refitted, three refittings involved flakes from the two clusters (C family, Fig. 6), and we could observe differences in shaping techniques between the two clusters. In "H17", organic percussion was the main technique used for phase 2 while in "F17" this technique is applied to the same phase but mostly to the finest grained silicites (Fig. 6).

Some major criteria and morphological characteristics allowed us to discriminate organic and indirect percussion. Dihedral butts (Fig. 8, PT2608, PT2652) and the few spur butts (Fig. 8, PT2646) observed are organic percussion discriminators. When the flake butt removed a large part of the bifacial edge, the contact area on the butt dihedral ridge is defined by a diffuse bulb and radial fissures (Fig. 8, PT2608). For each flake we observed the butt was well prepared, abraded and softened, on the larger flakes the softening (*doucissage* in French) was heavy. So the knappers showed particular attention to every flake removal using organic percussion. The flake profiles

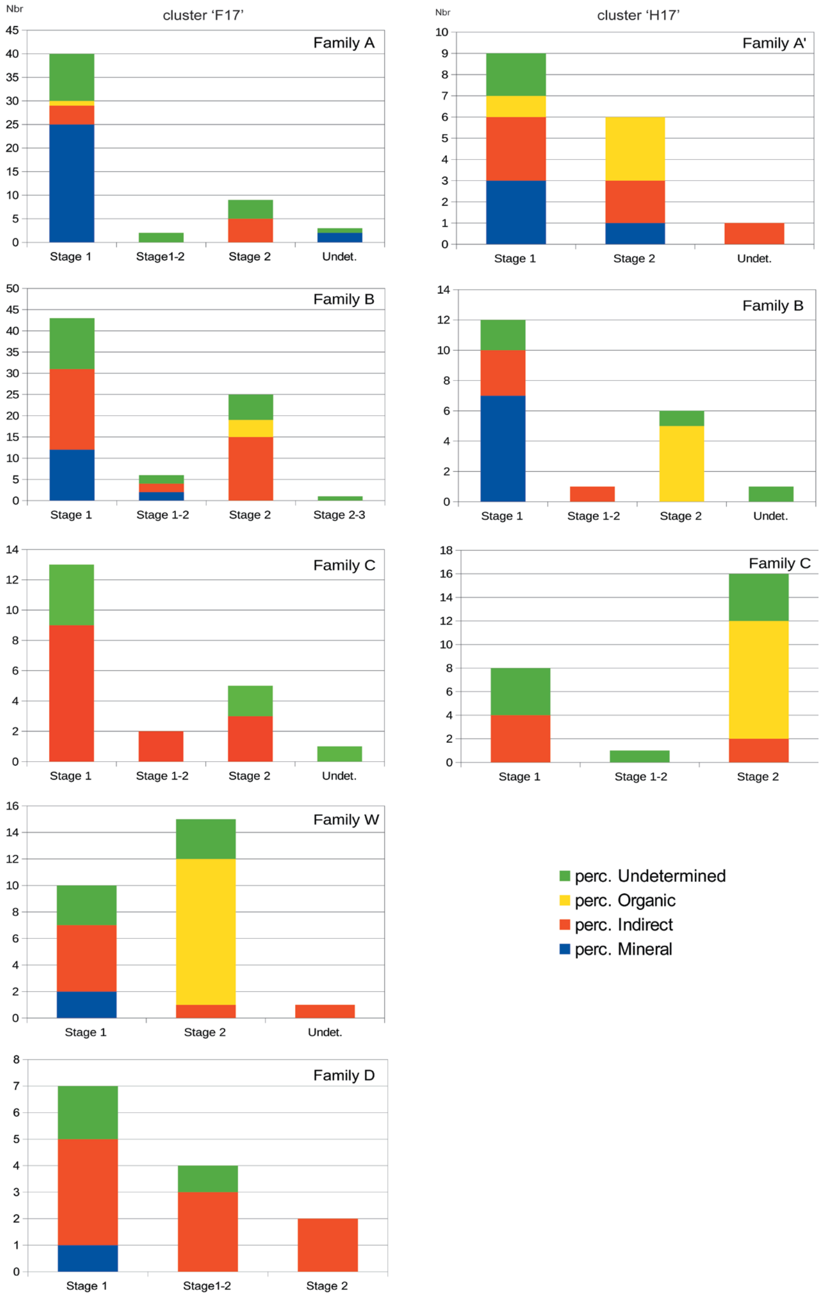


Fig. 6. Shaping technique diagnosis for some raw material families from clusters "F17" and "H17".

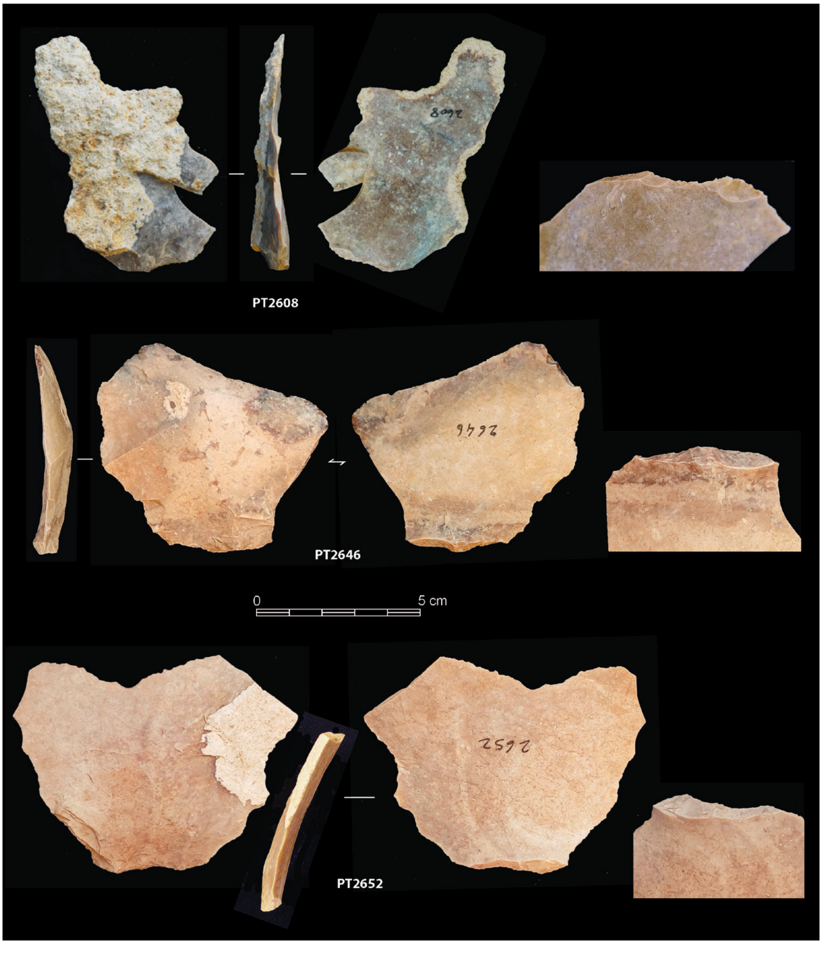


Fig. 7. Evidence of organic (direct) percussion in cluster "F17" at stage 1 (PT2608) and stage 2 (PT2652, PT2646).

obtained with this technique are regularly slightly arched. Removed from surfaces with a low transversal convexity, these flakes usually show divergent edges (Fig. 8). On the other hand, indirect percussion allows the use of a negative bulb as a striking platform initiating a fracture where an organic hammer could not strike without touching the sides of the concavity (Pélegrin 2012; Fig. 7). Using hammerstones on concave butts is also possible, in this case we referred to other diagnosis criteria such as the hammer size needed to remove the flake compared to the butt morphology

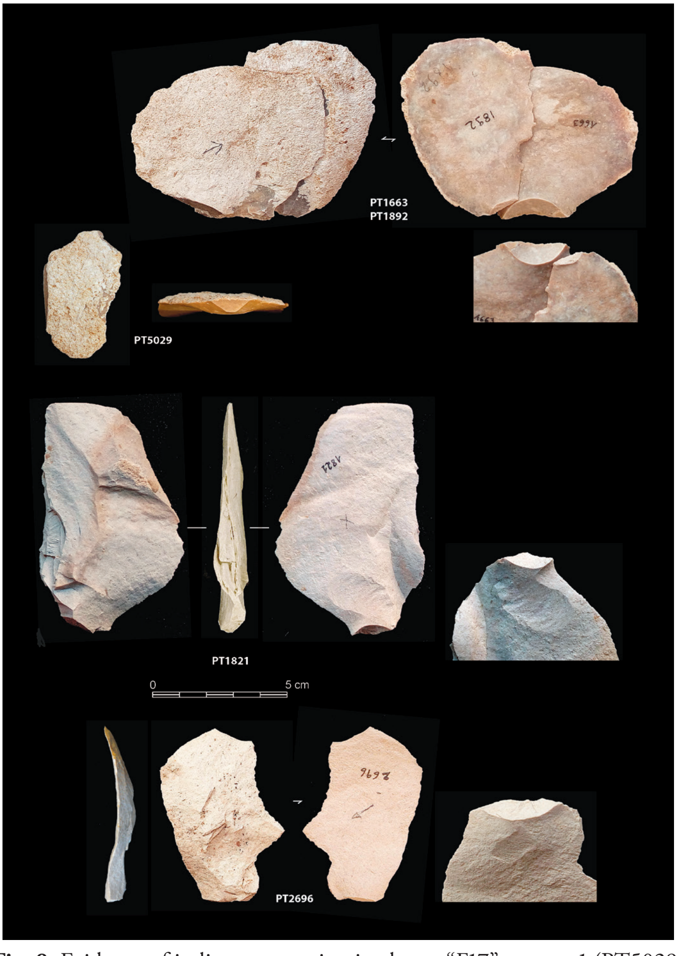


Fig. 8. Evidence of indirect percussion in cluster "F17" at stage 1 (PT5029; refitting PT1663-PT1892) and stage 2 (PT2696, PT1821).

and the flake size together with the general characteristics of the flake (butt preparation, profile, regularity). The other types of butts associated with indirect percussion are plane or rarely faceted. Circular or oval punch prints can be present on every type of butt, potentially bringing confusion with direct percussion. Some may think that butt lips indicate organic percussion use (Fig. 7 and 8), as a matter of fact they are mechanical marks of bending fractures due to a low angle between the striking platform and the knapped surface (Bertouille 1989), actually they can result from any percussion technique. Because organic percussion needs a low angle between the striking platform and the knapped surface to be efficient, butt lips are associated with this technique, but they cannot be considered as exclusive indicators. As the knapper chose precisely the point of fracture initiation by positioning the punch, indirect percussion does not require the same intensity in butt preparation as organic percussion. So in “F17” and “H17” abrasion was not systematically applied because not systematically needed (Fig. 7, PT1821), when it was the action was rudimentary and never finished with softening. The mechanical advantage of indirect percussion over direct percussion is that the shock wave is channelised through the punch and so goes less sideways at the strike point and stays more centred. The results are more regular products, like second Mesolithic and Neolithic blades and bladelets showing very straight parallel edges and ridges. On the cortical flake of low transversal convexity PT1663 (Fig. 7) the conchoidal fracture is diverging in the proximal part then goes straight with parallel edges in the mesio-distal part before the convex termination. This flake characteristic differentiates it from flake PT2608 (Fig. 8). On flake PT2696 (Fig. 7) the mesial shoulder created by an oblique ridge had no effect on the parallelism of the edges. Its typical concavo-convex profile and its concave butt, bearing a small protuberance on its left side, argue for indirect percussion. Mostly in cluster “F17” we observed elongated flakes (length > 2 x width), bearing parallel edges and /or ridges, related to phase 2, or, to an early phase 2 removing cortex and avoiding phase 1 (cf. infra). Resulting from a convexity working, these flakes always show the variability of butts associated with indirect percussion described previously. They never bear dihedral or spur butts nor elaborated butt preparations, their profiles are arched or concavo-convex.

The quantity of classified flakes with traces of indirect percussion reaches 54% in F17 (N = 217), and those indicating organic percussion only 15% of them. For “H17”, organic percussion was used in 41% of the classified material (N = 61) and indirect percussion for 35%. So cluster “F17” was more specialised in indirect percussion shaping than “H17”. A quick examination of large flakes from cluster “F13” indicates an appreciable use of indirect percussion too. These three major clusters of material from phase 1 and 2 shaping are unified by the same use of techniques.

In “F17”, we observed in some families of raw material a tendency pointing to an early shaping phase 2 working convexity at the same time as removing cortex, using organic (Fig. 8, PT2628) and indirect percussion (cf. supra). This lack of roughing-out by thick flake removals, probably means the transverse sections and / or dimensions of some blocks were close to those of the required preforms.

Some straight flakes obtained by indirect percussion relative to thinning and regularizing a plane surface (Fig. 7, PT 1821) indicates plano-convex shaping and probably the making of adzes. Was indirect percussion use a favourite technique to shape adzes preforms at Chessy? The only complete abandoned preform found in cluster “F19” is for an adze.

At Chessy, compared to the amount of flake waste, the lack of discarded preforms (one complete with an irregular edge in “F19”, a burnt fragment in the same cluster, plus another fragment used as hammer in “F17”) raise the question of the skill of the knappers. Our main hypothesis is that skilled knappers used several techniques on good quality silicites to shape axe and adze preforms.

BEYOND THE WORKSHOPS OF THE MARNE AREA: LANDSCAPE MANAGEMENT

One question leads to another: can we explain why the knappers specifically settled in this location, some five kilometres as the crow flies from the nearest outcrops and with no known settlement in the immediate vicinity? What were the reasons for choosing this location when they could have settled much closer to the sources of raw materials, without having to travel great distances, loaded with raw or tested blocks? This phenomenon seems to be recurrent, and even more important since the Middle Neolithic II workshops at Jossigny – “le Pré du But” and at Montévrain – “le Clos Rose” (Seine-et-Marne department; Brunet and Blaser 2015: 141–151) are even further away from these sources (Fig. 1). A notable point at Chessy – as often is the case for this kind of site – is the almost total absence of ceramics and implements attesting to daily domestic life in the vicinity. Indeed, the tools collected in the silicite artefact clusters or just around them are directly or indirectly related to the knapping activities, between bush hammers (*boucharde* in French) for the finishing of axe heads (12 items) and denticulated or other tools (22 items) interpreted as for maintaining the efficacity of knapping tools in organic material for example. Outside the clusters, 44 typologically defined tools have been discovered, mostly denticulated, splintered and hammered pieces made from shaping flakes or reusing polished tools. A fragment of a leaf-like arrowhead discovered in the cluster “F13” and a complete one outside of the clusters are characteristic of the Michelsberg culture (Manolakakis and Garmond 2011) but were still in use in this part of the Paris Basin till the Recent Neolithic (Renard 2010). The few other objects of more domestic use (like endscrapers or re-touched flakes) are more than sufficient for the daily needs of one or more knappers, who are installed for the day at the different places, with limited food requirements. This is presumably the case at Chessy, whereas this scenario could be qualified for the other knapping sites in the area, where the flake *debitage* may be associated with the manufacture of axe heads. At Chessy, there is no production of blades or flakes. Most of the tools are made from the shaping of blanks, and the few cores (5 items) present on the site, as well as the few other siliceous rock objects, are diachronic with respect to the shaping workshops, making a clear association between them and the production of axe heads. A few other tools are typologically distinct and have also been considered as disconnected from the workshops and not contemporaneous.

Settling in such a place, the knappers would have made compromises concerning having the shortest possible distance between the outcrops or mines and the workshops, combined with the latter not far away from a settlement that allowed the continuation of daily work and to reduce the constraints of material life such as subsistence. Perhaps they came to the workshop sites for some days of intensive work while organising a light dwelling. The relative proximity to the sandstone outcrops – situated several kilometres further in the heart of the plateau – for the polishing phases of the axe heads seems to have been also a decisive point in the choice of location for their workshops. Despite substantial erosion, evidence of these choices would have been perceptible; but at Chessy we can affirm that they are absent, at least on the excavated surface. But an absence of evidence is not an evidence of absence.

If one wonders about the relative distance of the workshops on the plateau from the lithic resources, it should nevertheless be noted that workshops exist near the Jablines mines and at Coupvray. The knapping workshops at "la Pente de Croupeton" in Jablines, on the other hand, are devoted to the production of blades and flakes in relation to the settlement of Blicquy – Villeneuve-Saint-Germain (Aisne department; Early Neolithic). The knapping and shaping places at Coupvray – "le Chemin de Lesches" (Seine-et-Marne department) are dated to the Recent Neolithic and were dedicated to the roughing and regularization of bifacial blanks (Brunet 1994), while the clusters closer to the river seem to be oriented towards domestic production. A mixed situation of flake and axe head production is also noticed at Lesches – "les Prés du Refuge" (Seine-et-Marne department) during the Final Neolithic (Brunet *et al.*, 2004). These observations require us to leave the question of chronological attribution open, especially as most of the workshops in the region have not been precisely dated.

In the light of the date of production of Bartonian silicite axe heads at Jablines, all the workshops in the region are attributed by their excavators to the French Middle Neolithic II (see for example Brunet and Blaser 2015). The exploitation of silicites at Jablines took place between the end of the 5th to the 3rd millennium (Pazdur in Bostyn and Lanchon 1992: 233–234). The chrono-cultural attribution of the Chessy potsherds is weak, and the absence of charcoal or charred botanic remains means there is no possibility of absolute dating. An attribution to the Middle Neolithic II is very probable, but we cannot exclude a later phase of the Neolithic. The evidence is unclear, especially as there are no closed features such as pits related to these periods on the site.

The presence of a Middle Neolithic II enclosure at Vignely – "la Noue Fenard" (Seine-et-Marne department; Lanchon *et al*., 2006) in the area of the mineral resources, mines and workshops with tools made from the same material adds an argument for connecting the workshops in a territorial production network during the Middle Neolithic II, referring to similar settlements involving large-scale land management in other regions, such as the Seine/Mauldre confluence (Giligny and Bostyn 2016), the middle Oise and the Aisne valleys or the Mons basin in Belgium (Aubry *et al*., 2014).

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